
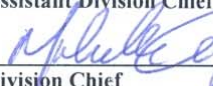


Recommend Approval:  7/25/11 Assistant Division Chief Date	Maryland Department of Transportation State Highway Administration Office of Materials Technology MARYLAND STANDARD METHOD OF TESTS	
Approved:  08/08/11 Director Date	<b>GLASS BEADS FOR PAVEMENT MARKINGS</b>	<b>MSMT 211</b>

### **SCOPE:**

These procedures are used to determine the Refractive Index (RI) and resistance to corrosion of glass beads used in pavement markings to produce a reflective surface on road markings and signs. The RI is determined by using the "Becke Method" for isotropic substances. This involves submerging the glass beads in different liquids of known indices and noting the movement of light. The resistance to corrosion is determined using sulfuric acid.

### **REFRACTIVE INDEX - BECKE METHOD**

### **MATERIALS AND EQUIPMENT:**

1. Microscope (approximately 35x) with below stage illumination and adjustable diaphragm.
2. Set of standardized refractive index liquids.
3. Concave slides.
4. Glass rod.

### **TEST PROCEDURE:**

1. Partially fill one concave of a slide with an immersion liquid. A liquid with an RI of 1.51 is usually a good starting point.
2. Obtain a representative portion of the sample containing 30 to 50 beads and completely immerse in liquid. It may be necessary to stir slightly with a glass rod in order to submerge all of the beads. The glass rod shall be free of contaminants and liquids of different indices.
3. Place slide on microscope stage and adjust focus and illumination. Reduce the light by means of the substage diaphragm, so that it is not too bright.
4. With the adjustment screw, alternately raise and lower the objective from the position of sharp focus. Look for a bright line (Becke Line) surrounding each glass bead moving toward or away from the bead as the stage lenses are moved. The rule is: when the distance between the

lens and the stage is increased, the Becke Line moves toward the glass bead when the latter has an index higher than the immersion liquid, and conversely.

5. Similar tests with other refraction liquids are made until the index of the glass beads is found to be between 2 consecutive indices identifying adjacent liquids in the set.
- \* If difficulty is encountered observing the Becke Line, the glass spheres shall be broken in a small agate mortar by gently tapping or crushing (not grinding) and observing fragments sieved to the No. 100 sieve and No. 200 sieve.

### **REPORT:**

The index is expressed as the average of the indices of the liquids in the 2 adjacent bottles  $\pm 1/2$  the difference between them.

For example:

$$N-1 = 1.510$$

$$N-2 = 1.520$$

$$N = 1.515 \pm .005$$

## **RESISTANCE TO CORROSION**

### **MATERIALS AND EQUIPMENT:**

1. 20x magnifying glass.
2. One percent solution of sulfuric acid.
3. Shallow glass tray capable of holding sample.
4. Glass plate larger than glass tray.
5. Oven capable of maintaining 150 F.

### **TEST PROCEDURE:**

1. Select a 1 x 2 in. representative sample of the marking material, adhere it to the bottom of a glass tray, and place just enough acid solution to completely immerse the sample.

2. Cover the tray with the glass plate to prevent evaporation, and allow the sample to soak for 24 hours.
3. After the 24 hour soaking period, decant the acid solution and dry the sample in the oven for 15 minutes without rinsing, touching, or otherwise disturbing the bead surfaces.
4. Remove the sample from the oven and examine the beads with the magnifying glass. Estimate the amount of glass beads having a distinct, opaque, white (corroded) layer on their entire surface.

**REPORT:**

Report to the nearest whole percent the amount of beads that show an opaque, white layer on their entire surface.